Claims

1. A method for protecting ships against terminal homing phase-guided missiles provided with a target data analysis system, wherein

(1) the missile moving towards the ship to be protected is detected by suitable sensors, located, and its expected trajectory is calculated by means of a computer;

(2) the type of target data analysis performed by the missile is detected by means of suitable sensors and algorithms, and the missile is classified with regard to the type of its target data analysis;

(3) the current wind speed and direction of wind is detected continuously by means of wind measuring sensors;

(4) the ship's own data:
travelling speed, direction of travel, rolling and pitching motions, is continuously detected by means of motion and/or navigation sensors;

(5) the detected data of (1) to (4) is transmitted to a fire control calculator by means of data interfaces;

(12) at least one dirigible decoy launcher is controlled by means of the fire control calculator and the firing of decoy ammunitions is initiated, with the fire control calculator controlling the deployment of the decoys based on the evaluated sensor data with regard to:
- kind of the ammunition type;
- number of the different ammunition types;

- temporal firing interval between successive ammunitions;
- the firing direction of each ammunition in azimuth and elevation, including the compensation of rolling and pitching motions of the ship;
- the delay time of the ammunitions from firing until activation of the effective charge, and thus the distance of the decoy effect;

and

(7) the fire control calculator calculates an optimal course of the ship and an optimal speed of the ship so as to support the separation of the decoy formation deployed from the ship to be protected in a control computer-supported manner; wherein

(8) the ship's on-board wind measuring equipment is used as the wind measuring sensors; and wherein

(9) the ship's own data is detected by the navigation equipment and the gyroscopic stabilization equipment of the ship to be protected or by means of separate acceleration sensors, in particular pitch, roll, or gyroscopic sensors,

characterized in that

(10) a particular decoy pattern is generated in dependence on the identified missile and the attack structure, with the appropriate decoy pattern for the respective type of threat, characterized in that missile type and homing behavior are stored in a database and fetched by the fire control calculator following identification of the missile

type and attack structure, in order to build up a corresponding decoy pattern.

2. The method in accordance with claim 1, characterized in that RF and/or IR and/or UV sensors, preferably the ship's on-board reconnaissance radars, are used for detection.

3. The method in accordance with claim 1 or 2, characterized in that standardized interfaces, in particular NTDS, RS232, RS422, ETHERNET, IR, BLUETOOTH interfaces, are used as data interfaces.

4. The method in accordance with any one of claims 1 to 3, characterized in that as decoy ammunitions, those with RF, IR, and combined RF/IR active compositions as well as unfolding, floating radio frequency reflectors, in particular radar reflectors (Airborne Radar Reflectors), are used.

5. The method in accordance with any one of claims 1 to 4, characterized in that as a fire control calculator a personal computer, a micro-controller control, or an SPS control is used, with the fire control calculator transmitting the determined data for deploying the decoy formation to the decoy launcher via a standardized data interface, in particular via a CAN bus (Controller Area Network bus).

6. The method in accordance with any one of claims 1 to 5, characterized in that unfolding decoys are used, wherein the folded decoys are fired by the decoy launcher and unfolded by means of gases during the launch.

7. The method in accordance with claim 6, characterized in that a radio frequency reflector, in particular a radar reflector, preferably a corner reflector, preferably a radar reflector having eight tri-hedral corner reflectors (tri-hedrals), in a particularly

preferred manner a corner reflector; preferably in the form of nettings or foils, is used as a decoy.

8. The method in accordance with claim 6 or 7, characterized in that the decoy is unfolded by inflating with hot gases.

9. The method in accordance with any one of claims 6 to 8, characterized in that the decoy is inflated by means of pyrotechnical gas generators, in particular airbag gas generators.

10. The method in accordance with any one of claims 1 to 9, characterized in that the decoy pattern is selected from the following geometrical configurations: sandwich; screen; tower; vertical camouflage screen (side-attack protection); horizontal camouflage screen (top-attack protection).

11. The method in accordance with any one of claims 1 to 10, characterized in that a decoy ammunition with programmable delay elements is used.

12. The method in accordance with any one of claims 1 to 11, characterized in that all of the decoy ammunitions used for a particular decoy pattern are formed such as to have an identical velocity of departure (v_0).

13. A protective system apparatus for the protection of ships against terminal homing phase-guided missiles comprising a target data analysis system, comprising:

at least one computer;

sensors for detecting terminal homing phase-guided missiles having a target data analysis system for discriminating between

genuine and spurious target, that approach a ship to be protected;

sensors for detecting the direction of approach, distance, and velocity of the missiles;

wind measuring means for wind speed and direction of wind;

motion and/or navigation sensors for detecting the ship's own data: travelling speed, direction of travel, rolling and pitching motions;

at least one fire control calculator, wherein in particular fire control calculator and computer form a unit; and wherein the fire control calculator communicates with the sensors via data interfaces;

at least one decoy launcher arranged on the ship and dirigible in azimuth and elevation, which is equipped with decoy ammunitions, wherein the ammunition types comprise RF, IR, and combined RF/IR ammunitions as well as unfolding corner reflectors,

characterized in that

the computer includes a database in which appropriate decoy patterns for the respective missile type and the respective attack structure are stored, which allow to generate, in dependence on the identified missile and the attack structure, a particular decoy pattern so as to effectively protect a ship against the identified threat.

14. Apparatus in accordance with claim 13, characterized in that the decoy launcher includes the following components:

- a launching platform as a carrier of the single decoy ammunitions;
- electric launching means which fire the single decoy ammunitions in randomly adjustable temporal intervals,
- an elevational drive for movement in height of the launching platform,
- an azimuthal drive for sideways movement of the launching platform,
- a base platform for receiving the drives,
- shock absorbers at the base platform for attenuating rapid ship movements particularly brought about by mine detonation shocks;
- STEALTH trimmings for reducing the ship's signature in the RF and IR ranges, preferably formed of obliquely inclined metallic or carbon fiber surfaces;
- a suitable interface which transmits the delay time of the decoy ammunition(s) from launch to activation of the effective charge immediately prior to launch from the decoy launcher to the decoy ammunition(s), preferably having the form of an electric plug-in connection or of an inductive connection via two corresponding coils.

15. Apparatus in accordance with claim 13 or 14, characterized in that the decoy ammunitions comprise integrated, electronic delay elements freely programmable by means of the fire control calculator.

16. Apparatus in accordance with any one of claims 13 to 15, characterized in that the decoy launchers are provided with electric, hydraulic, or pneumatic directional drives, with the angular acceleration in the azimuthal direction and in the elevational direction being at least 50 DEG/s^2.

17. Apparatus in accordance with any one of claims 13 to 16, characterized in that RF and/or IR and/or UV sensors,

preferably the ship's on-board reconnaissance radars, are provided for detection.

18. Apparatus in accordance with any one of claims 13 to 17, characterized in that standardized interfaces, in particular NTDS, RS232, RS422, ETHERNET, IR, BLUETOOTH interfaces are provided as data interfaces.

19. Apparatus in accordance with any one of claims 13 to 18, characterized in that as decoy ammunitions, those with RF, IR, and combined RF/IR active compositions as well as unfolding, floating radio frequency reflectors, in particular radar reflectors (Airborne Radar Reflectors) are provided.

20. Apparatus in accordance with claim 19, characterized in that unfolding decoys are provided, wherein the folded decoys are fired by the decoy launcher and are adapted to be unfolded by means of gases during the launch.

21. Apparatus in accordance with claim 20, characterized in that a radio frequency reflector, in particular a radar reflector, preferably a corner reflector, preferably a radar reflector having eight tri-hedral corner reflectors (tri-hedrals), in a particularly preferred manner a corner reflector; preferably in the form of nettings or foils, is provided as a decoy.

22. Apparatus in accordance with claim 20 or 21, characterized in that the decoy may be unfolded by inflating with hot gases.

23. Apparatus in accordance with any one of claims 13 to 22, characterized in that the decoy may be inflated by means of pyrotechnical gas generators, in particular airbag gas generators.

24. Apparatus in accordance with any one of claims 13 to 23, characterized in that a decoy ammunition with programmable delay elements is provided.

25. Apparatus in accordance with any one of claims 13 to 24, characterized in that all of the decoy ammunitions used for a particular decoy pattern are formed such as to have an identical velocity of departure (v_0).

26. Apparatus in accordance with any one of claims 13 to 25, characterized in that as a fire control calculator a personal computer, a micro-controller control or an SPS control is provided, with the fire control calculator transmitting the determined data for deploying the decoy formation to the decoy launchers via a standardized data interface, in particular via a CAN bus (Controller Area Network bus).